IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In Re Application of: WEBER ET AL	§ Atty File: NOVA 9250
Serial No.: 10/706,336	§ Group Art Unit: 1772
Filed: 11/12/2003	§ Examiner: A. N. CHEVALIER

For: THIN WALLED POLYETHYLENE CONTAINER

BRIEF ON APPEAL

Commissioner for Patents
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I. REAL PARTY IN INTEREST

The real party in interest is NOVA Chemicals (International) S.A.

II. RELATED APPEALS, INTERFERENCES, AND JUDICIAL PROCEEDINGS

There are no other appeals, interferences or judicial proceedings known to appellants which will directly affect or be directly affected by or have a bearing on the board's decision in this pending appeal.

III. STATUS OF CLAIMS

Claims 1 to 3 are pending in this appeal and claims 1 to 3 stand rejected.

IV. STATUS OF AMENDMENTS

There are no outstanding amendments to the claims. Claim 1 was previously amended in view of 35 USC 112 rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

There is only one independent claim (claim 1) and the claims are all argued together. There are no means plus function recitations under 25 USC 112, sixth paragraph in the present claims.

In general, the claimed subject matter relates to a polyethylene container which has a desirable balance of i) a comparatively high softening point and ii) good impact resistance (as determined by ASTM D5276). The container of this invention is prepared from a high density polyethylene (having a density of from 0.950 to 0.955 g/cc). The high

density polyethylene used in this invention also has a very specific molecular weight distribution (Mw/Mn) of from 2.2 to 2.8.

Claim 1 is representative and is reproduced below for convenience.

1. A container having a nominal volume of 100 mL to 12 L prepared by injection molding of ethylene copolymer resin, said container having a Vicat softening point of greater than 121°C and an average test drop height point value, as determined by ASTM D5276, of greater than 2.5 feet, wherein said ethylene copolymer resin is characterized by:

i) a density from 0.950 g/cc to 0.955 g/cc;

ii) a viscosity at 100,000 sec^{-1} shear rate and 280°C of less than 3.5 Pascal seconds;

iii) a molecular weight distribution, weight average molecular weight/number average molecular weight, of from 2.2 to 2.8; and

iv) a hexane extractables content of less than 0.5 weight%.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The rejection of claims 1 to 3 as unpatentable under 35 USC 103(a) over Whetten et al. (U.S. Patent No. 5,804,660) in view of de Groot et al. (U.S. Patent No. 5,747,594).

A copy of the references cited by the examiner and relied on in the final rejection are attached in (IX) EVIDENCE APPENDIX: Whetten et al. (U.S. Patent No. 5,804,660) and de Groot et al. (U.S. Patent No. 5,747,594).

VII. ARGUMENT

Claims 1 to 3 are not obvious under 35 USC 103(a) over Whetten et al. (U.S. Patent No. 5,804,660) in view of de Groot et al. (U.S. Patent No. 5,747,594).

The argument is provided in two sections, namely an "Overview/Summary" which describes the present issues in general terms and a "Detailed Argument" which is directly responsive to all matters raised by the examiner in the final rejection. The Detailed Argument is essentially the same as appellants' previous response to the final rejection.

Overview/Summary

In general terms, the present invention might be described as providing an injection molded (I/M) polyethylene container which has a good balance of properties, including a) a high softening point and b) good "drop strength" (also referred to herein as "impact strength").

The high softening point allows the container to be hot filled (for example, with molten margarine).

The high drop strength provides some measure of protection from the consequences that follow when such a full container is refrigerated, then accidentally dropped onto a hard kitchen floor.

The present container is prepared from a polyethylene having a density of from 0.950 to 0.955 grams per cubic centimeter (g/cc), (as well as a defined range of viscosities and a defined level of hexane extractables – which those skilled in the art will recognize as being useful for the preparation of I/M containers). It will be readily appreciated by those skilled in the art that a conventional polyethylene having this very high density should provide a "high softening point" but it will not provide I/M containers having good impact

strength. Thus, the problem that the present invention addresses might be framed by considering the following "framing question": How can I prepare an I/M container having a high softening temperature and good impact strength, starting from a polyethylene resin having a density of from 0.950 to 0.955 g/cc?

One "possible answer" to the "framing question" is provided by the teachings of the prior art cited by the examiner, i.e., the use of an impact modifier to improve the impact strength of the brittle high density resin. Appellants readily acknowledge that the use of impact modifiers in I/M applications is well known. However, appellants also wish to note that the use of large quantities of a low density impact modifier will also typically decrease the softening point of the finished container.

In any event, the present invention provides a different answer to the "framing question". In particular, the present invention employs a polyethylene having a very specific molecular weight distribution (or MWD) of from 2.2 to 2.8 (where the MWD is calculated by dividing the weight average molecular weight by the number average molecular weight – or "Mw/Mn"). Appellants have previously described this as a "comparatively narrow" MWD (in the sense that it is narrower that the MWD that is generally obtained when preparing high density polyethylene with a conventional Ziegler Natta catalyst).

The appellants disclosure also teaches that such a polyethylene might be prepared using the process described in U.S. Patent No. 6,372,864 (Brown et al. '864). Brown et al. '674 teach the use of two polymerization reactors to broaden the molecular weight distribution of polyethylene that is produced with a "single site" catalyst. Thus, it would also be correct to describe the polyethylene composition that is used in the present invention

as having a "slightly broader" MWD than the MWD which can be obtained using a "single site" catalyst in a single, well mixed polymerization reaction. Accordingly, appellants have solved the problem of the above described "framing question" through the use of a polyethylene composition having a very specifically defined MWD.

Appellants respectfully submit that nothing in the prior art suggests the preparation of an I/M container using the polyethylene composition that is specified by the claims at issue.

Appellants note that the examiner has alleged that the prior art teaches the use of polyethylene composition having a molecular weight distribution of from 2.2 to 2.8 (with reference to Whetten et al. at col 8, lines 60-62). Appellants respectfully submit that this allegation is in error and represents either:

a) a misunderstanding; or (alternatively)

b) misinterpretation

of the teachings of the prior art.

Specifically, the I/M compositions of Whetten et al. were prepared by blending two resins – "Component A" and "Component B". The teaching of Whetten et al. (at column 8, lines 60-62) is in reference to one of the blend components – not to the overall blend of components A and B.

Thus, to reiterate, the present invention solves the problem of the above "framing question" through the use of a polyethylene composition which has a MWD of from 2.2 to 2.8. Appellants respectfully submit that the prior art in no way teaches or suggests this critical element of the present invention.

This may be illustrated by considering two (hypothetical) types of blends of components A + B. In both types of (hypothetical) blends, both of components A + B have a MWD of 2.6 – which is "in the middle" of the MWD of the I/M compositions that are used in the present invention.

In the first (hypothetical) blend, both of components A + B have an Mn of 100,000 – in this case, the overall blend of components A + B will also have an MWD of 2.6 (regardless of the relative amounts of components A + B).

In the second (hypothetical) blend, component A (which has a MWD of 2.6) has an Mn of 2,000 and component B (which also has a MWD of 2.6) has an Mn of 500,000. The following observations may be made about the second blend:

a) a 50/50 blend of these components would have an extremely broad MWD; and

b) the absolute value of the MWD of the blend will be strongly influenced by the relative amounts of components A + B in the blend.

Whetten et al. make absolutely no teaching or suggestion of the MWD of their blends of components A + B – nor do they provide data which would suggest the MWD of their blends.

Finally, appellants note that the examiner has requested certain experimental evidence, based on the examiner's assertion that "the combination of Whetten and de Groot disclose all the limitations of the ethylene copolymer used to make the container". For the reasons noted above, appellants respectfully submit that the examiner's assertion is in error – simply put, no combination of the teachings of Whetten and de Groot in any way suggests the use of an overall I/M composition having an MWD of from 2.2 to 2.8.

<u>Detailed Argument</u>

The invention defined by the present claims relates to an injection molded (hereinafter "I/M") container which is characterized by a unique balance of properties, which properties might be qualitatively described as:

i) a high degree of stiffness at high temperature (which allows the container to be filled at elevated temperatures); and

ii) excellent drop strength.

These properties are quantitatively defined by the claims. Specifically, the container is characterized by having both of:

i) a Vicat softening point in excess of 121°C (which illustrates that the container has stiffness/rigidity at a high temperature); and

ii) a drop strength value of greater than 2.5 feet as measured by ASTM D5276.

Appellants acknowledge that it has previously been possible to produce injection molded polyethylene containers having a high stiffness. For example, this may be achieved by using a polyethylene having a very high density. However, these stiff/rigid containers of the prior art are comparatively brittle – and these prior art brittle containers do not exhibit the high drop strength of the containers of the present invention.

Appellants also acknowledge that it has previously been possible to produce injection molded polyethylene containers having good drop strength. For example, this may be achieved by using a polyethylene having a lower density and/or a lower molecular weight (or viscosity). However, these impact resistant containers of the prior art have comparatively lower Vicat softening points.

The I/M containers of the present invention are characterized by having a unique combination of the above described desirable properties, namely a high Vicat softening point and good drop strength.

The containers of the present invention are prepared from a very narrowly defined type of polyethylene. While not wishing to be bound by theory, it is believed that the excellent balance of properties of the present I/M containers is a result of a combination of all of the characteristics of the specific polyethylene which is defined in the claims. In particular, the polyethylene must meet all of the following conditions:

a) it must be a copolymer; and

b) it must have a comparatively high density (of from 0.950 to 0.955 g/cc); and

c) it must have a viscosity of less than 3.5 Pascal seconds at a temperature of 280°C and a shear rate of 100,000 sec^{-1}; and

d) it must have a comparatively narrow molecular weight distribution Mw/Mn of from 2.2 to 2.8; and

e) it must have a hexane extractables content of less than 0.5 weight%.

The examples show that a "single" polyethylene (i.e. one which does not contain a second polyethylene which is blended into the composition after the polymerization reaction) may be used to achieve this result.

Appellants respectfully submit that a person or company who is undertaking an injection molding process would prefer to use a "single" polyethylene as opposed to a post-reactor blend because the use of a post reactor blend may increase costs and/or process complexities.

Claims 1-3 were rejected under 35 USC 103(a) as being unpatentable over U.S.P. 5,804,660 (hereinafter Whetten et al. '660) in view of USP 5,747,594 (hereinafter de Groot et al. '594).

Whetten et al. '660 disclose injection molded containers which are made with a polymer blend which is characterized by the use of a specific impact modifier. The impact modifier is generally included an amount of from 1-25 weight%. The impact modifier must have a very low density (specifically, from 0.85 g/cc to 0.91 g/cc). The impact modifier also must be a "homogenous linear ethylene/α-olefin copolymer". Additional properties of these impact modifier copolymers are described at column 8 of Whetten et al. '660. Whetten et al. '660 add the impact modifier to "at least one polyolefin" which is present in an amount of from 75 to 95 weight% of the total, impact-modified composition.

The "at least one" polyolefin may be either polypropylene or a polyethylene having a density of from 0.920 to 0.960 g/cc.

The examiner noted that the teachings of Whetten et al. '660 also encompass a preference for a narrow molecular weight distribution (with respect to column 8, lines 60-62). However, appellants respectfully note that the teaching at column 8, lines 60-62 is with respect to the "impact modifier" (i.e. the minor component of the blends of Whetten et al. '660). Moreover, this impact modifier must have a very low density (of from 0.85 to 0.91 g/cc). That is, Whetten et al. '660 do not specify the use of a narrow molecular weight distribution for the overall composition which is to be injection molded.

In other words, Whetten et al. '660 teach the use of a very low density impact modifier which has a narrow molecular weight distribution. Whetten et al. '660 do not teach

or suggest the criticality of using an overall I/M composition which has a high density and/or a narrow molecular weight distribution. In fact, the examples which illustrate the disclosure of Whetten et al. '660 use a polyethylene having a broad molecular weight distribution (see the description of the Examples, particularly at column 12, lines 48-54, and column 13, lines 49-52).

Furthermore, Whetten et al. '660 in no way teach or suggest the criticality of using an overall I/M composition which has a density of from 0.950 to 0.955 g/cc. This is made particularly clear by a consideration of the data which are provided by Whetten et al. '660 - none of the inventive I/M composition of Whetten et al. '660 have a density of from 0.950 to 0.955 g/cc.

Thus, Whetten et al. '660 generally disclose the impact modification of at "least one polyolefin" using a specific impact modifier. The impact modifier has a very low density (0.85 to 0.91 g/cc) and a narrow molecular weight distribution.

However, Whetten et al. '660 do not provide any teachings with respect to the criticality of either the density or the molecular weight distribution of either the "at least one polyolefin" which is to be impact modified or the corresponding density and molecular weight properties of the overall I/M composition. In fact, to the extent that these properties are exemplified, Whetten et al. '660 might be said to teach away from the polyethylenes which are used in the present invention (given the comparatively low density and broad molecular weight distribution of the composition exemplified by Whetten et al. '660).

Turning now to the physical properties of the I/M containers disclosed by Whetten et al. '660.

The examiner has noted that Whetten et al. '660 do not disclose the Vicat softening temperature of their I/M parts.

Moreover, and more importantly, appellants respectfully submit that Whetten et al. '660 in no way teach or suggest an I/M part having both a Vicat softening temperature in excess of 121°C and good drop strength.

As previously noted, claims 1-3 were rejected under 35 US 103 as being obvious in view of Whetten et al. '660 combined with de Groot et al. '594. The judicial test for obviousness is set out in *Graham vs. John Deere Co.* (383 U.S. 1, 148 USPQ 459 (1966)).

The test requires the following factual inquiries:

1) Determining the scope and contents of the prior art.

2) Ascertaining the differences between the prior art and the claims at issue.

3) Resolving the level of ordinary skill in the pertinent art.

4) Considering objective evidence present in the application indicating obviousness or non-obviousness.

The teachings of Whetten et al. '660 are generally described above. Several important differences between the teachings of Whetten et al. '660 and the I/M parts of the present invention have also been described.

The differences include:

1) Whetten et al. '660 do not disclose any Vicat softening point data (in particular Whetten et al. '660 do not teach or suggest a Vicat softening temperature in excess of 121°C);

2) Whetten et al. '660 do not teach or suggest that an I/M container having good drop strength may be prepared from a polyethylene copolymer having a density of

greater than 0.950 g/cc. (In fact, appellants respectfully submit that the teaching of Whetten et al. '660, where considered as a whole, teach away from this finding. That is, Whetten et al. '660 generally disclose the use of a very low density impact modifier to improve impact strength. Moreover, Whetten et al. '660 do not exemplify any "inventive" I/M containers made from a polyethylene composition having a density in excess of 0.950 g/cc);

3) In view of the above, appellants respectfully submit that Whetten et al. '660 in no way teach or suggest a I/M part having a combination of high Vicat softening point and good drop strength.

Moreover, appellants respectfully submit that Whetten et al. '660 in no way teach or suggest the criticality of the selected polyethylene which is used in the present invention. Specifically:

4) Whetten et al. '660 do not teach or suggest the critical use of a polyethylene copolymer having a density of greater than 0.950 g/cc; and

5) Whetten et al. '660 do not teach or suggest the critical use of a polyethylene copolymer having a molecular weight distribution of from 2.2 to 2.8.

The *Graham vs. John Deere Co.* test also requires that these differences be considered in the context of a person of ordinary skill in the pertinent art. In this context, appellants acknowledge that the examiner has admitted that Whetten et al. '660 do not disclose Vicat softening point (or hexane extractables). The examiner has argued that it would require only routine experimentation to determine an optimum Vicat softening point. Appellants admit that such tests are routine, but appellants respectfully submit that this

determination of Vicat softening point of the I/M parts taught by Whetten et al. '660 would not lead to the present invention.

Specifically, the present invention requires a combination of a high Vicat softening point and a good drop strength.

Moreover, it will be recognized by those skilled in the art that a type of "trade-off" exists between Vicat softening point and impact strength. It is generally known that improved impact strength may be achieved by lowering the density – but at the expense of Vicat softening point. This "trade-off" is discussed, for example, in de Groot et al. '594 at column 1, lines 54-65. The inventive examples of Whetten et al. '660 have low density and good impact strength. However, Whetten et al. '660 do not teach the Vicat softening point of these parts.

Appellants respectfully submit that this silence (about Vicat softening point) should not be construed as indicating that the I/M parts taught by Whetten et al. '660 have a high Vicat softening point. In fact, the low density of the I/M parts of Whetten et al. '660 strongly suggests that these parts will not have a high Vicat softening point.

In contrast, the present invention teaches and claims the use of polyethylene having a density greater than 0.950 g/cc – and the resulting I/M parts are expressly shown to have a high Vicat softening point.

In addition, appellants specify the use of a polyethylene having a narrow molecular weight distribution (Mw/Mn) of from 2.2 to 2.8. Appellants believe that this is critical to the present invention, and Whetten et al. '660 do not teach or suggest it.

Thus, appellants respectfully submit that no combination of the teachings of the prior art would lead a person of ordinary skill in the art to the present invention. Simply stated:

appellants respectfully submit that no combination of the cited prior art suggests or makes obvious the use of an ethylene copolymer having a very high density of from 0.950 to 0.955 g/cc; a comparatively narrow molecular weight distribution of from 2.2 to 2.8 to prepare the I/M container of the present invention.

The claims were rejected in view of a combination of the teachings of Whetten et al. '660 with those of de Groot et al. '594.

The examiner relied upon de Groot et al. '594 to argue that "a high Vicat softening point promotes heat restraints and are more economically prepared...." (with reference to column 2 lines 4-20). Appellants admit that a high Vicat softening point improves heat resistivity.

However, the present invention is directed toward an I/M container which is prepared from a high density ethylene copolymer having a very high Vicat softening point (in excess of 121°C).

The teaching of de Groot et al. '594 relate to blends of low density polyethylene (where the first blend component has a density of from 0.85 to 0.92 g/cc and the second blend component has a density of from 0.89 to 0.942 g/cc). As will be appreciated by those skilled in the art, the Vicat softening points of such resins are comparatively low. This may be confirmed with reference to Figure 2 of de Groot et al. '594 (where the maximum Vicat softening temperature of the resins illustrated by de Groot et al. '594 is less than 120°C). Further confirmation of the low Vicat softening points of the resins exemplified in de Groot et al. '594 is obtained with reference to the data provided in the Examples.

In any event, de Groot et al. '594 in no way teach or suggest an I/M container having both a high Vicat softening point and good drop strength. Additionally, de Groot et al. '594 make absolutely no teaching or suggestion that such an I/M container having a good balance of Vicat softening and drop strength may be prepared using a polyethylene copolymer.

In conclusion, it is respectfully submitted that all claims on appeal are patentably distinct over applied references to Whetten et al. '660 in view of de Groot et al. '594. Thus, appellants respectfully request that the board reverse the decision of the examiner and remand the application for allowance of claims 1 to 3 and issuance of a patent.

Respectfully Submitted,

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VIII. CLAIMS APPENDIX

CLAIMS ON APPEAL

1. A container having a nominal volume of 100 mL to 12 L prepared by injection molding of ethylene copolymer resin, said container having a Vicat softening point of greater than 121°C and an average test drop height point value, as determined by ASTM D5276, of greater than 2.5 feet, wherein said ethylene copolymer resin is characterized by:

i) a density from 0.950 g/cc to 0.955 g/cc;

ii) a viscosity at 100,000 sec^{-1} shear rate and 280°C of less than 3.5 Pascal seconds;

iii) a molecular weight distribution, weight average molecular weight/number average molecular weight, of from 2.2 to 2.8; and

iv) a hexane extractables content of less than 0.5 weight%.

2. The container of claim 1 which is further characterized by having a total impact energy required for wall failure of greater than 3.0 foot-pounds at 23°C.

3. The container of claim 1 which is further characterized by having a total impact energy required for base failure of greater than 0.20 foot-pounds at -20°C as determined by ASTM D3763.

IX. EVIDENCE APPENDIX

A copy of the references cited by the examiner and relied on in the final rejection:

Whetten et al. (U.S. Patent No. 5,804,660)

de Groot et al. (U.S. Patent No. 5,747,594).

X. RELATED PROCEEDINGS APPENDIX

NONE